CCF (R)

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A – 6366

Reg. No. : ....

Name : ....

Fifth Semester B.Tech. Degree Examination, September 2016
(2008 Scheme)
08.501 : ENGINEERING MATHEMATICS – IV (ERFBH)

Time : 3 Hours

Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. The pdf of a continuous random variable X is given by $f(x) = \begin{cases} \lambda e^{-\lambda x}, & x \geq 0 \\ 0 & , x < 0 \end{cases}$

   Find the probability that :

   i) $X \leq 1$

   ii) $X > 1$.

   Also find the distribution function of X.

2. The probability of error in transmission of a bit over a communication channel is 10^{-4}. What is the probability of more than three errors in transmitting a block of 1000 bits ?

3. Analog signal received at a detector is modeled as a normal random variable with mean 200 microvolts and variance 256 microvolts at a fixed point of time. What is the probability that the signal will exceed 240 microvolts ?

4. If X is uniformly distributed with mean 1 and variance 4/3, find P[X < 0].

5. Two lines of regression are x + 2y – 5 = 0 and 2x + 3y – 8 = 0 and variance of x is 12. Find $\bar{x}$, $\bar{y}$, r and σy.

6. In a random sample of 450 industrial accidents it was found that 230 were due to unsafe working conditions. Construct 95% confidence interval for population proportion.

P.T.O.

7. Define the following terms :

   i) Null hypothesis

   ii) Level of significance

   iii) Critical region.

8. The joint pdf of X and Y is given by $f(x, y) = \begin{cases} K(2x+3y) & 0 \le x, y \le 1 \\ 0 & \text{Otherwise} \end{cases}$.

   Find K and the marginal distribution of X.

9. Define Auto correlation, Auto covariance and spectral density.

10. Customers arrive at a ticket counter according to a Poisson process with mean rate of 2 per minute. In an interval of five minutes, find the probability that the number of customers arriving is more than 3 ?

PART – B

Answer **one** question from **each** Module. **Each** question carries **20** marks.

Module – I

11. a) Find the mean and variance of the binomial distribution.

    b) The mileage which car owners get with a certain kind of radial type is a random variable having an exponential distribution with mean 40,000 km. Find the prob. that one of the tyres will last :

       i) atleast 20,000 km

       ii) atmost 30,000 kms.

    c) If X is uniformly distributed in (–3, 3), find P[1X – 2| < 2].

12. a) Out of 800 families with 4 children each, how many families would be expected to have 2 boys and 2 girls, assuming equal probability for boys and girls.

    b) The marks obtained by in a certain subject follows normal distribution with mean 65 and SD 5. If 3 students are selected at random from this group, find the probability that atleast one of them would have scored above 75 ?

c) The number of monthly breakdowns of a computer is a random variable having a Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month :

i) Without a breakdown

ii) With only one breakdown.

Module – II

13. a) Find the lines of regression using the following data :

X :	60	61	62	62	63	64	65	67
Y :	61	62	57	61	65	65	61	64

b) The heights of 10 randomly selected students in a school in inches are 50, 52, 52, 53, 55, 56, 57, 58, 58 and 59. Test the hypothesis that mean height of students of the school is 54 inches.

14. a) Convert the equation $y = ax + bx^2$ to linear form and fit the same to the following data :

X :	1	2	3	4	5
Y :	5	7	9	10	11

b) The sales data of an item in six shops before and after a special promotional campaign are as follows :

Before campaign :	53	28	31	48	40	42
After campaign :	58	29	30	55	56	45

Test at 5% level of significance whether the campaign was a success.

Module – III

15. a) Distinguish between SSS and WSS. Give an example for each.

b) If $X(t) = P + Qt$, where P and Q are independent random variables with $E(P) = p$ and $E(Q) = q$, $Var(P) = \sigma_1^2$, $Var(Q) = \sigma_2^2$. Find $E(X(t))$, $R(t_1, t_2)$. Is the process $\{X(t)\}$ stationary in the wide sense.

c) Suppose the probability that a dry day following a rainy day is $1/3$ and the probability that a rainy day following a dry day is $1/2$ given that May 1 is a dry day, what is the probability that May 3^{rd} is a dry day.

16. a) Find the spectral density function of the process with Auto correlation function $R(\tau) = 1 + e^{-\alpha|\tau|}$.

b) If $X(t) = A \sin t + B \cos t$ is a process where A and B are independent random variables with zero mean and equal variance σ^2. Find $E(X(t))$ and $R(t_1, t_2)$.

c) The tpm of a Markov Chain $\{X_n\}$ with states 1, 2, 3 is $P = \begin{bmatrix} 0 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & 0 & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} & 0 \end{bmatrix}$

Calculate :

i) $P[X_2 = 1/X_0 = 1]$

ii) $P[X_3 = 2/X_0 = 3]$.
